(19) Japanese Patent Office

(11) Publication Number
5-33335

(12) THE UTILITY MODEL GAZETTE (Y2)

(51)Int.Cl.[5]	Identification code	Office File Numbers	(24)(44) Publication date 25th Aug. 1993
B 32 B	27/12	7258-4F	
	3/14	7016-4F	
	27/30 101	8115-4F	

(Total 3 sheets)

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(54) Title of the device: A waterproof material with outstanding apparel characteristics

(21) Application number: 62-63407 (63407-1987)

(22) Application date: 28th April 1987

(65) Laid-open number: 63-170224 (170224-1988)

(43) Laid-open date: 7th November 1988

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(57) Scope of Utility Model Claims

1 A waterproof material with outstanding apparel characteristics which is formed by providing a waterproof layer comprising a polyurethane resin on the surface of a fabric via an adhesive agent layer and, furthermore, providing a discontinuous layer of vinyl chloride resin projections/indentations on the surface of said waterproof layer, of height 0.03 to 0.3 mm and of printed area no more than 50%.

2 A waterproof material according to Claim 1 where the adhesive agent layer comprises a polyacrylate resin adhesive or a polyurethane resin adhesive.

3 A waterproof material according to Claims 1 or 2 where the polyurethane resin of the waterproof layer is an amino acid-modified polyurethane resin.

4 A waterproof material according to any of Claims 1 to 3 where the adhesive agent layer and the waterproof layer are moisture-permeable.

Detailed Description of the Utility Model

This utility model relates to a waterproof material; more particularly, it relates to a waterproof material with outstanding apparel characteristics where the face in contact with the skin has the form of projections/indentations and which possesses moisture permeability.

At present, the waterproof materials which are normally used are primarily those where the undersurface of a base material is coated with a polyacrylate ester resin,

a polyurethane resin, a polyethylene resin, a chloroprene resin, a polyvinyl chloride resin or the like, and when sewing together clothes using such a waterproof material, in high-grade products there is provided a lining, while in ordinary products it is normal to leave the coated face exposed.

However, in the latter case, a marked sultry or sweaty state arises as a result of the perspiration produced at the time of wearing and an uncomfortable feel is imparted, so recently attempts have been made to overcome such problems by developing and employing on a practical basis a waterproof material which is also moisture permeable. However, while a tentative effect is to be had in the case of light motion, when motion is marked the amount of perspiration produced is considerable, so there is the disadvantage of an extremely uncomfortable feel, in particular when there is marked condensation of perspiration on the coated resin face and contact between the skin and the wet resin face takes place when the waterproof clothes are removed. Thus, a comfortable waterproof material is demanded where such problems are resolved.

The objective of the present utility model lies in offering a waterproof material which does not have an unpleasant feel even when the skin comes into contact with the coated face where perspiration has condensed.

The present inventor has carried out a painstaking investigation to overcome the aforesaid disadvantages of waterproof materials and, as a result, has devised an extremely effective utility model.

Specifically, this utility model is a waterproof material with excellent apparel characteristics which is formed by providing a waterproof layer comprising a polyurethane resin on the surface of a fabric via an adhesive agent layer and, furthermore, providing a discontinuous layer of vinyl chloride resin projections/indentations on the surface of said waterproof layer, of height from 0.03 to 0.3 mm and of printed area no more than 50%.

Below, the waterproof material of the present utility model is explained by means of the appended drawing.

Figure 1 shows an example of the waterproof material according to the present utility model, where **1** is a knitted or woven fabric comprising mixed-spun synthetic fibre and other fibre, and on the undersurface of said fabric there is provided a waterproof layer **3** via an adhesive agent layer **2** and, furthermore, there is in turn formed a layer **4** of projections/indentations on the surface of said waterproof layer.

The adhesive agent layer **2** is obtained by applying a polyacrylate ester resin or a polyurethane resin, and it lies between the base material **1** and waterproof layer **3** and serves to improve the adhesion there-between. Said waterproof layer **3** comprises a polyurethane resin (which may also be an amino acid-modified polyurethane resin or the like) to which various types of colouring agents and fillers have been added, and it serves to prevent water from penetrating from the outside.

Waterproof materials of the aforesaid structure are already known, and the chemical composition of the

polyurethane resin forming the waterproof layer used can be suitably selected from those resins already employed in polyurethane resin waterproof materials of the laminate type. Specifically, there can be used, as the adhesive agent layer and as the waterproof layer, a layer which is formed by carrying out application to the base material of a resin solution comprising polyurethane resin or amino acid-modified polyurethane resin dissolved in dimethylformamide, after which the dimethylformamide is extracted into water to form a microporous coated film, or alternatively there is used an emulsion liquid of polyurethane resin and this then subjected to a drying method to form a microporous coated film.

The characteristic feature of the present utility model is that, on the polyurethane resin layer which has been adhesion-laminated as described above, polyvinyl chloride resin is affixed in the form of a layer **4** of discontinuously-formed projections/indentations of height from 0.03 to 0.3 mm and of printed area no more than 50%. This layer of projections/indentations **4** is preferably formed by printing, such as by gravure printing, but the method of applying a vinyl chloride resin in which is mixed a blowing agent which releases nitrogen gas or the like, and then heating to bring about blowing, can also be used insofar as the conditions of height and printed area specified in this utility model are satisfied.

As the polyvinyl chloride resin, a so-called paste resin comprising polyvinyl chloride powder dispersed in a plasticizer is ideal but there can also be used an organosol, or the like, where mineral terpene is added.

Where the printed area of the layer of projections/indentations 4 is too large, or the height of the projections too low, the resin area from which the layer of projections/indentations is composed will be too flat and the effects obtained are markedly lowered, so such cases lie outside of the present utility model. Thus, from this point of view, the printed area will be no more than 50% and preferably 5 to 20%, while the height of the projections will be 0.05 to 0.3 mm and preferably 0.1 to 0.2 mm.

By providing the vinyl chloride resin on the polyurethane resin waterproof layer in the form of a layer of projections/indentations as stated above, there is the effect that, as well as being endowed with the inherent functions of the waterproof material, the apparel characteristics and durability are also outstanding.

Consequently, the printed area is appropriately no more than 50% and preferably 5 to 20%, and the height of the projections is appropriately 0.05 to 0.3 mm and preferably 0.1 to 0.2 mm.

Now, with regard to the aforesaid adhesive agent layer or waterproof layer, by employing a layer which is formed by carrying out application to the base material of a resin solution comprising a polyurethane resin or amino acid-modified polyurethane resin dissolved in dimethylformamide, after which the dimethylformamide is extracted into water to form a microporous coated film, or, alternatively, by using an emulsion liquid of polyurethane resin and then carrying out a drying method

to form a microporous coated film, said layer can be used as an adhesive agent layer or as a waterproof layer which also confers moisture permeability.

Next, the present utility model is further explained by means of examples.

Example 1

As the adhesive agent layer, a resin solution of the following formulation was applied using a doctor blade, at a coverage of 5 g/m^2 (by conversion to solids content) to the undersurface of a dyed material comprising a 210 yarn nylon taffeta (warp and weft both 70 denier nylon yarns) obtained in the usual way, after which drying was carried out for 3 minutes at 100°C.

Criscoat P1019 (polyacrylate ester resin solution, produced by Dainippon Ink Kogyo	100 parts
Criscoat NX (isocyanate crosslinking agent, produced by Dainippon Ink Kogyo	1 part

As a waterproof layer, there was applied, on the surface of the adhesive agent layer obtained, a resin solution of the following formulation at a coverage of 22 g/m^2 (by conversion to solids content) using a doctor blade, and then drying was carried out under the same conditions.

Leathermin 3612 (polyurethane resin, produced by Dainichi Seika Kogyo)	100 parts
Aluminium Paste M1100 (aluminium paste, produced by Toyo Aluminium Co.)	10 parts

Then, on the surface of the waterproof layer thus obtained, there was applied a vinyl chloride paste of the following formulation by means of a 50 mesh gravure roll and drying carried out for 3 minutes at 100°C, after which a heat treatment was conducted for 2 minutes at 170°C, to obtain a layer of projections/indentations where the height of the projections was 0.15 mm and the printed area was 11%.

Sumilit PX-NL (vinyl chloride paste resin, produced by Sumitomo Chemical Co.)	100 parts
DOP (plasticizer)	60 parts
mixed terpene	10 parts
dibasic phosphite	2 parts
calcium carbonate	20 parts

Next, immersion was performed in a waterproofing agent of the following formulation, after which the material was squeezed-out to a 40% pick-up and dried, to obtain a waterproof material of outstanding apparel characteristics having projections/indentations at the undersurface of the fabric.

Asahiguard AG730 (a fluorine-based waterproofing agent, made by Asahi Glass)	5 parts
water	95 parts

Example 2

After applying an adhesive layer of the following formulation with a doctor blade at a coverage of 6 g/m^2 (by conversion to solids component) to a dyed material identical to that in Example 1, the material was

immersed in a water bath for 10 minutes at 20°C, then mangled and dried.

Crisbon 8006HV (polyurethane resin, produced by Dainippon Ink Kogyo Co.)	100 parts
Barnock BL-50 (isocyanate crosslinking agent, produced by Dainippon Ink Kogyo)	2 parts

Next, as a waterproof layer, a resin solution of the following *(sic)*[1] formulation was applied by means of a doctor blade at a coverage of 27 g/m^2 (by conversion to solids content) onto the surface of the adhesive agent layer thus obtained, then immersion performed for 10 minutes in a water bath at 20°C, after which further immersion was carried out for 20 minutes in a hot water bath at 60°C to extract the dimethylformamide remaining in the resin layer, and then mangling and drying were carried out.

A foam vinyl chloride paste of the following formulation was applied onto the surface of the waterproof layer obtained, using a 50 mesh gravure roll, and then drying carried out for 3 minutes at 100°C, after which heat treatment was carried out for 2 minutes at 170°C, to obtain a layer of projections/indentations in which the height of the protruding regions was 0.2 mm and the printed area was 11%.

Sumilit PX-NL (vinyl chloride paste resin, made by Sumitomo Chemical Ind.)	100 parts
DOP	60 parts
mineral terpene	10 parts
dibasic phosphite	2 parts

calcium carborate 20 parts

Unicel ND (foaming agent, made by Ohtsuka Yakuhin) 5 parts

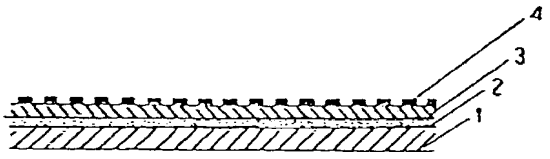
Immersion was then performed in an identical waterproofing agent to that in Example 1, after which the fabric was squeezed out to a 40% pick-up and dried, and there was obtained a waterproof material of outstanding apparel characteristics having projections/indentations on the fabric undersurface.

When the moisture permeation was measured in accordance with the method in JIS K-0208, it was found to be 4300 g/m^2, so there was excellent moisture permeability.

Brief Explanation of the Drawing

The figure is a magnified cross-sectional view showing an embodiment of the present utility model.

1 … base material, 2 … adhesive layer, 3 … waterproof layer, 4 … layer of projections/indentations



Translator's Note

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[i] No following formulation is given in the Japanese original.